

WHAT IS CLAIMED IS:

1. A surface acoustic wave filter comprising:  
a piezoelectric substrate;  
an insulating pattern disposed on the piezoelectric substrate and having permittivity less than that of the piezoelectric substrate; and  
a conductor pattern disposed on at least one of the piezoelectric substrate and the insulating pattern; wherein  
a portion of the conductor pattern defines IDTs and another portion of the conductor pattern defines wiring traces; and  
at a portion where wiring traces having different potentials face each other in a plan view, at least a portion of at least one of the wiring traces is disposed on the insulating pattern.
2. A surface acoustic wave filter according to Claim 1, wherein the conductor pattern includes a first conductor pattern disposed on the piezoelectric substrate, a portion thereof defining the IDTs, and a second conductor pattern which is in conduction with the first conductor pattern, a portion thereof being disposed on the insulating pattern.
3. A surface acoustic wave filter according to Claim 1, wherein the relative permittivity of the insulating pattern is less than about 4.
4. A surface acoustic wave filter according to Claim 1, wherein the insulating pattern includes resin.
5. A surface acoustic wave filter according to Claim 1, wherein the insulating pattern has a thickness of about 0.5  $\mu\text{m}$  or more.

6. A surface acoustic wave filter according to Claim 1, wherein the relative permittivity of the piezoelectric substrate is about 20 or more.
7. A surface acoustic wave filter according to Claim 6, wherein the piezoelectric substrate includes at least one of  $\text{LiTaO}_3$ ,  $\text{LiNbO}_3$ , and  $\text{Li}_2\text{B}_4\text{O}_7$ .
8. A surface acoustic wave filter according to Claim 1, wherein the center frequency of a pass band is about 500 MHz or more.
9. A surface acoustic wave filter according to Claim 1, wherein the center frequency of a pass band is about 1 GHz or more.
10. A surface acoustic wave filter according to Claim 1, wherein the surface acoustic wave filter has a balance-to-unbalance transformer function and includes a balanced signal terminal and an unbalanced signal terminal.
11. A surface acoustic wave filter according to Claim 10, wherein at least one of a wiring trace connected to the balanced signal terminal and a wiring trace connected to the unbalanced signal terminal is disposed on the insulating pattern.
12. A communication apparatus comprising the surface acoustic wave filter according to Claim 1.
13. A surface acoustic wave filter comprising:
  - a piezoelectric substrate;
  - a first conductor pattern disposed on the piezoelectric substrate, a portion of the first conductor pattern defining IDTs and at least another portion of the first conductor pattern defining a first wiring pattern;
  - an insulating pattern disposed on the piezoelectric substrate and on the first wiring pattern; and

a second conductor pattern disposed on the piezoelectric substrate and on the insulating pattern and being in conduction with the first conductor pattern, at least a portion of the second conduction pattern defining a second wiring pattern; wherein

at a portion where wiring traces having different potentials face each other in a plan view in the first and second wiring patterns, at least a portion of at least one of the wiring traces is disposed on the insulating pattern; and

the first wiring pattern crosses the second wiring pattern at at least one point, with the insulating pattern disposed therebetween.

14. A surface acoustic wave filter according to Claim 13, wherein one of the wiring traces having different potentials receives an input signal and the other wiring trace receives an output signal.

15. A surface acoustic wave filter according to Claim 13, wherein the relative permittivity of the insulating pattern is less than about 4.

16. A surface acoustic wave filter according to Claim 13, wherein the insulating pattern includes resin.

17. A surface acoustic wave filter according to Claim 13, wherein the insulating pattern has a thickness of about 0.5  $\mu\text{m}$  or more.

18. A surface acoustic wave filter according to Claim 13, wherein the relative permittivity of the piezoelectric substrate is about 20 or more.

19. A surface acoustic wave filter according to Claim 18, wherein the piezoelectric substrate includes at least one of  $\text{LiTaO}_3$ ,  $\text{LiNbO}_3$ , and  $\text{Li}_2\text{B}_4\text{O}_7$ .

20. A surface acoustic wave filter according to Claim 13, wherein the center frequency of a pass band is about 500 MHz or more.

22. A surface acoustic wave filter according to Claim 13, wherein the center frequency of a pass band is about 1 GHz or more.

23. A surface acoustic wave filter according to Claim 13, wherein the surface acoustic wave filter has a balance-to-unbalance transformer function and includes a balanced signal terminal and an unbalanced signal terminal.

24. A surface acoustic wave filter according to Claim 23, wherein at least one of a wiring trace connected to the balanced signal terminal and a wiring trace connected to the unbalanced signal terminal is disposed on the insulating pattern.

25. A communication apparatus comprising the surface acoustic wave filter according to Claim 13.

26. A surface acoustic wave filter including series-arm resonators and parallel-arm resonators arranged in a ladder pattern on a piezoelectric substrate, comprising:

a piezoelectric substrate;

an insulating pattern disposed on the piezoelectric substrate and having permittivity less than that of the piezoelectric substrate; and

a conductor pattern disposed on at least one of the piezoelectric substrate and the insulating pattern; wherein

a portion of the conductor pattern defines IDTs and another portion of the conductor pattern defines wiring traces; and

at least a portion of the wiring traces is disposed on the insulating pattern.

27. A surface acoustic wave filter according to Claim 26, wherein at least a portion of the wiring traces, in a portion except a portion for allowing the ground pads and the parallel-arm resonators to be in conduction, is disposed on the insulating pattern.

28. A surface acoustic wave filter according to Claim 26, wherein the surface acoustic wave filter includes a plurality of filter elements disposed on the piezoelectric substrate.
29. A surface acoustic wave filter according to Claim 26, wherein the relative permittivity of the insulating pattern is less than about 4.
30. A surface acoustic wave filter according to Claim 26, wherein the insulating pattern includes resin.
31. A surface acoustic wave filter according to Claim 26, wherein the insulating pattern has a thickness of about 0.5  $\mu\text{m}$  or more.
32. A surface acoustic wave filter according to Claim 26, wherein the relative permittivity of the piezoelectric substrate is about 20 or more.
33. A surface acoustic wave filter according to Claim 32, wherein the piezoelectric substrate includes at least one of  $\text{LiTaO}_3$ ,  $\text{LiNbO}_3$ , and  $\text{Li}_2\text{B}_4\text{O}_7$ .
34. A surface acoustic wave filter according to Claim 26, wherein the center frequency of a pass band is about 500 MHz or more.
35. A surface acoustic wave filter according to Claim 26, wherein the center frequency of a pass band is about 1 GHz or more.
36. A communication apparatus comprising the surface acoustic wave filter according to Claim 26.
37. A surface acoustic wave filter including series-arm resonators and parallel-arm resonators arranged in a ladder pattern on a piezoelectric substrate, comprising:  
a piezoelectric substrate;

a first conductor pattern disposed on the piezoelectric substrate, a portion of the first conductor pattern defining IDTs and at least another portion of the first conductor defining a first wiring pattern;

an insulating pattern disposed on the piezoelectric substrate and on the first wiring pattern; and

a second conductor pattern disposed on the piezoelectric substrate and on the insulating pattern and being in conduction with the first conductor pattern, at least a portion thereof defining a second wiring pattern; wherein

at a portion where wiring traces having different potentials face each other in a plan view in the first and second wiring patterns, at least a portion of at least one of the wiring traces is disposed on the insulating pattern; and

the first wiring pattern crosses the second wiring pattern at at least one point, with the insulating pattern disposed therebetween.

38. A surface acoustic wave filter according to Claim 37, wherein a portion of the second wiring pattern defines wiring traces for enabling ground pads to be directly in conduction, and the wiring traces cross the first wiring pattern, with the insulating pattern disposed therebetween.

39. A surface acoustic wave filter according to Claim 37, wherein at least part of the wiring traces, in a portion except a portion for allowing the ground pads and the parallel-arm resonators to be in conduction, is disposed on the insulating pattern.

40. A surface acoustic wave filter according to Claim 37 wherein the surface acoustic wave filter includes a plurality of filter elements disposed on the piezoelectric substrate.

41. A surface acoustic wave filter according to Claim 37, wherein the relative permittivity of the insulating pattern is less than about 4.

42. A surface acoustic wave filter according to Claim 37, wherein the insulating pattern includes resin.

43. A surface acoustic wave filter according to Claim 37, wherein the insulating pattern has a thickness of about 0.5  $\mu\text{m}$  or more.

44. A surface acoustic wave filter according to Claim 37, wherein the relative permittivity of the piezoelectric substrate is about 20 or more.

45. A surface acoustic wave filter according to Claim 44, wherein the piezoelectric substrate includes at least one of  $\text{LiTaO}_3$ ,  $\text{LiNbO}_3$ , and  $\text{Li}_2\text{B}_4\text{O}_7$ .

46. A surface acoustic wave filter according to Claim 37, wherein the center frequency of a pass band is about 500 MHz or more.

47. A surface acoustic wave filter according to Claim 37, wherein the center frequency of a pass band is about 1 GHz or more.

48. A communication apparatus comprising the surface acoustic wave filter according to Claim 37.

49. A surface acoustic wave filter including series-arm resonators and lattice-arm resonators arranged in a lattice pattern on a piezoelectric substrate, comprising:

a piezoelectric substrate;

an insulating pattern disposed on the piezoelectric substrate and having permittivity less than that of the piezoelectric substrate; and

a conductor pattern disposed on at least one of the piezoelectric substrate and the insulating pattern; wherein

a portion of the conductor pattern defines IDTs and another portion of the conductor pattern defines wiring traces; and

at least a portion of the wiring traces is disposed on the insulating pattern.

50. A surface acoustic wave filter according to Claim 49, wherein the relative permittivity of the insulating pattern is less than about 4.

51. A surface acoustic wave filter according to Claim 49, wherein the insulating pattern comprises resin.

52. A surface acoustic wave filter according to Claim 49, wherein the insulating pattern has a thickness of about 0.5  $\mu\text{m}$  or more.

53. A surface acoustic wave filter according to Claim 49, wherein the relative permittivity of the piezoelectric substrate is about 20 or more.

54. A surface acoustic wave filter according to Claim 53, wherein the piezoelectric substrate includes at least one of  $\text{LiTaO}_3$ ,  $\text{LiNbO}_3$ , and  $\text{Li}_2\text{B}_4\text{O}_7$ .

55. A surface acoustic wave filter according to Claim 49, wherein the center frequency of a pass band is about 500 MHz or more.

56. A surface acoustic wave filter according to Claim 49, wherein the center frequency of a pass band is about 1 GHz or more.

57. A communication apparatus comprising the surface acoustic wave filter according to Claim 49.

58. A surface acoustic wave filter including series-arm resonators and lattice-arm resonators arranged in a lattice pattern on a piezoelectric substrate, comprising:  
a piezoelectric substrate;



a first conductor pattern disposed on the piezoelectric substrate, a portion of the first conductor pattern defining IDTs and at least another portion of the first conductor pattern defining a first wiring pattern;

an insulating pattern disposed on the piezoelectric substrate and on the first wiring pattern; and

a second conductor pattern disposed on the piezoelectric substrate and on the insulating pattern and being in conduction with the first conductor pattern, at least a portion thereof defining a second wiring pattern; wherein

at a portion where wiring traces having different potentials face each other in a plan view in the first and second wiring patterns, at least a portion of at least one of the wiring traces is disposed on the insulating pattern; and

the first wiring pattern crosses the second wiring pattern at at least one point, with the insulating pattern disposed therebetween.

59. A surface acoustic wave filter according to Claim 58, wherein the relative permittivity of the insulating pattern is less than about 4.

60. A surface acoustic wave filter according to Claim 58, wherein the insulating pattern includes resin.

61. A surface acoustic wave filter according to Claim 58, wherein the insulating pattern has a thickness of about 0.5  $\mu\text{m}$  or more.

62. A surface acoustic wave filter according to Claim 58, wherein the relative permittivity of the piezoelectric substrate is about 20 or more.

63. A surface acoustic wave filter according to Claim 62, wherein the piezoelectric substrate includes at least one of  $\text{LiTaO}_3$ ,  $\text{LiNbO}_3$ , and  $\text{Li}_2\text{B}_4\text{O}_7$ .

64. A surface acoustic wave filter according to Claim 58, wherein the center frequency of a pass band is about 500 MHz or more.

65. A surface acoustic wave filter according to Claim 58, wherein the center frequency of a pass band is about 1 GHz or more.

66. A communication apparatus comprising the surface acoustic wave filter according to Claim 58.